Murder, She Modeled: Modeling to Support Crimino-Forensic Processes

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Abstract. Digital technologies are increasingly used by law enforcement in forensic processes. This opens the door to new opportunities for the use of conceptual modeling techniques to support pro-active collection and modeling of crime scene evidence—especially for the more challenging case of soft evidence. As opposed to digital evidence and other 'hard' evidence (such as finger prints and DNA samples), 'soft' evidence refers to heterogeneous meta-data on the crime scene (such as modus operandi, victim's background, etc.), which challenges the automation and support of both collection and modeling processes for such evidence. Using homicide crime scene staging (HCSS) as a case study, we explore the challenges and opportunities that an approach applying conceptual modeling techniques offers to support crimino-forensic processes in the collection and systematic modeling of soft evidence.

Keywords: Conceptual Modeling · User Stories · Misuse Cases · Crime scene staging · Homicide.

1 Introduction

The increasing use of digital technologies by law enforcement provides new opportunities for popularizing the application of systems analysis and modeling techniques to help structure criminological analysis. Such techniques have been recently applied, e.g., to automate and promote pro-activity of collection of digital evidence at crime scenes [20]. Digital evidence, i.e., information stored on digital devices involved in a crime scene, is considered 'hard' evidence, along with e.g., finger prints and DNA samples. Less attention has been paid to the application of conceptual modeling techniques to supporting collection of 'soft' evidence. Soft evidence refers to all types of meta-data on the crime scene (such as modus operandi, victim's background, etc.). It plays a crucial role in the initial classification of cause of death in potential homicide cases. Classifying a death as non-criminal results in the termination of all forensic processes, and stops mandatory autopsy of the body and forensic inspection of the death scene.

Thus mistaken classification at this stage leads to the loss of crucial forensic evidence [3].

One important reason for misclassifications of cause of death is criminal staging of the murder scene by the perpetrator (i.e., murders staged either as a natural death or as a non-natural yet non-criminal death [6]). Usually homicide crime scene staging (HCSS) is an ad hoc or preplanned action aiming at wilfully misdirecting the criminal investigation by manipulating physical or verbal evidence [15], which bears substantial implications for the ability to identify homicide [21]. This phenomenon remains one of the least studied aspects of crime scene analysis [21], and its estimated frequency is up to 8% of all homicide scenes.

To determine whether HCSS has ocurred, a plethora of soft evidence needs to be gathered in order to reconstruct what has happened before, during, and after the homicide. Conceptual modeling techniques may be very valuable here as they allow for a simpler, more structured overview of all the relevant information, conveying relationships and structure between details that would otherwise be lost in masses of textual documents.

Suspected staged crime scenes, where soft evidence has been tampered with, pose a useful case study for the application of conceptual modeling techniques to model how the actions of those involved in the crime scene affect its soft evidence. Applying conceptual modeling techniques to support this is timely because the incidence of such killings are on the rise, and more importantly, because convictions in such cases rely mostly, if not exclusively, on circumstantial soft evidence. Circumstantial convictions pose a major challenge to judicial procedures, as they require ample comprehensive evidence that might be overlooked and missed if law enforcement misinterprets the scene at the time of initial arrival. Without sufficient circumstantial soft evidence, HCSS cases where the killers do not confess to the killing they committed, render themselves practically impossible for criminal conviction—leading to the acquittal of the killer and injustice to the victim's family and society. Circumstantial convictions in cases of HCSS require ample collection of multiple sorts of soft evidence, such as the defendant's behavior before/during/after the death, their behavior at the death scene, nature of prior relations between defendant and victim, the victim's financial beneficiary, lifestyle, social relations, and so on.

Objectives—The aim of this research-in-progress paper is to explore the potential benefits and challenges of applying conceptual modeling techniques for supporting soft evidence collection and analysis from a criminological point of view. In particular, we discuss capturing how staging behavior affects the collection of soft evidence in crime scenes. We focus on a case study of a homicide where the crime scene was staged, and show how capturing behavior of the criminal and law enforcement provides a clearer picture of which actions challenged the collection of soft evidence. In doing so, we show the potential of *patterns of staging behavior* that can be extracted through the use of conceptual modeling techniques, which can be an invaluable resource for the development of

evidence-based criminological tools to support evidence collection and classification of death decision making upon initial arrival at a homicide crime scene.

Contribution—we present a preliminary user story and (mis)use case driven analysis of staging patterns from real crime scene data developed iteratively with a criminologist, showing how actions can be mapped to user stories and into balanced (mis)use case diagrams which show criminal and law enforcement activities as adversarial parties, and the benefit this brings from a criminologists' point of view.

In the remainder of this research-in-progress paper, Section 2 provides background regarding homicide crime scene staging and the challenges for capturing evidence of staging; Section 3 demonstrates how we used conceptual modeling techniques with a criminologist to capture HCSS actions and model how they affect the criminal investigation; and Section 4 concludes by discussing the importance of building a support system for criminologists and law enforcement which can use such models to support homicide investigation.

2 Homicide Crime Scene Staging

2.1 Background

Research identifies three main types of homicide crime scene staging (HCSS) as being: (1) primary staging, which is either ad hoc or pre-planned and aims to misdirect the criminal investigation by way of manipulating physical or verbal evidence; (2) secondary staging that manipulates the crime scene devoid of the intention to misdirect the investigation; and (3) tertiary scene alterations aimed at protecting the dignity of the deceased victim [10]. The type of staging that is most difficult to uncover by law enforcement is primary staging, particularly those that are pre-planned. In such cases there are hardly any direct witnesses as killers tend to plan, kill and stage while in isolated scenes, manipulate physical evidence in the scene in order to mislead criminal investigation, and hardly admit or confess to the killing and scene staging they committed.

According to Douglas and Munn [11], staging materializes when someone purposefully alters the crime scene prior to the arrival of the police in order to either redirect the investigation away from the most logical suspect, or to protect the victim or the victim's family. Staging is attained by altering physical evidence at the scene after and at times before the homicide, in order to present a misleading appearance of the crime scene. It imitates a "legitimate death" scenario or a disappearance of the victim [4,21]. Staging is thus a primary means of purposefully obstructing the criminal justice process by concealing the true nature of a crime [15,5].

Analyzing the profiles of both offenders and victims, HCSS researchers have found clear evidence of gender relevance to their identity as victims or perpetrators. First and foremost, a relationship or acquaintance with the victim is associated with homicide staging cases [10]. More to the point, the most common victim-offender relationship involving HCSS is an intimate partner relationship,

and most staged homicidal scenes involve the killing of an intimate partner [21]. These HCSS characteristics align with the fact that in most HCSS cases the perpetrator knows the victim, and the perpetrator was the last person to have seen the victim alive. Added to this typicality are other gendered HCSS features: stagers are more often men rather than women [16,15], and women comprise the majority of victims of crimes where HCSS took place [21].

Current literature is divided as to the prevalence of HCSS, with some estimating it as high as approximately 8 percent of all homicidal crime scenes [22,15,16]. Most often these crime scenes are indictable at first glance as the murder scene stager has altered or eliminated all direct evidence. Since staging is a primary means of purposefully obstructing the criminal justice process by concealing the true nature of the crime [15], the criminological nature of such crimes poses a major challenge to the police, investigators, prosecution and judicial process. Undetected at all, or detected at a later stage of police investigation, often leads to detrimental total loss of crucial and indispensable forensic evidence needed to secure criminal procedure and conviction [3,6,7].

As the case study in Section 3.1 will demonstrate, 'gut' feelings at the death scene, based on soft evidence, are crucial. Indeed, homocide detectives often use 'gut' feeling to assess whether a crime scene may be staged. Geberth, a former commander in the NYPD's Bronx Homocide Division noted:

> "In my experience investigating suspicious deaths I have often times had a 'gut' feeling that something was amiss. Actually, that 'gut' feeling is your subconscious reaction to the presentation, which should alert you to the possibility that, things are not always what they appear to be, consistent with equivocal death investigations." [14]

However, these 'gut' feelings, or intuitions, are highly dependent on vast experience of the investigator. A more systematic, rationale-based means for supporting crime scene investigations based on known staging behavior could assist inexperience and veteran investigators alike to ensure that important evidence is not overlooked.

Several attempts toward this direction can be found in the literature. For example, Omeleze and Venter [18] proposed a "digital forensic application requirements specification (DFARS) process" as a first step toward developing an effective application of this sort. Pasquale et al. [20] worked on *digital* forensics, emphasizing its difference from 'offline' forensics, and proposing an adaptive security approach, whose adaptation depends on suspicious events and investigation findings. Some effort has also be invested in building supporting databases. Schlesinger et al. [22] studied a large sample (N=946) of homocide crime scenes within the United States, finding that 8.4% of the cases were staged, identifying a number of different types of staging and their characteristics. Focusing specifically on staging, Hazelwood and Napier [15] performed a survey with 20 law enforcement officers, through which they identified motives for staging, and the acts that occur before it is performed. More recently, Ferguson and Wayne [13] examined common features in homicide crime scene staging, finding that sim-

ulation of self-injury was most frequent. Ferguson and McKinley [12] further explored staging, arguing that many homicides likely remain misclassified.

2.2 The Challenge of Applying Conceptual Modeling Techniques in HCSS

The major challenge in applying conceptual modeling techniques for collecting soft evidence in staged homicide crime scenes is that extant approaches to support evidence collection processes for e.g., digital evidence (cf. [20]) presuppose the existence of a domain model of a crime scene. This is a significant challenge for crimes in the physical world, as modeling real crime scenes (as opposed to e.g., the electronic devices related to a crime scene) pose several knowledge representation problems. Similar to the frame problem well known in the philosophy of Artificial Intelligence [8], it is impossible to make decisions on the basis of only what is relevant to an ongoing situation, without first having explicitly considered many more factors that are not relevant. In other words: when law enforcement arrives at a crime scene it is impossible to only look at what is (ultimately) relevant to the crime at hand. Moreover, many current approaches proposed in literature to support crime scene analysis through reasoning support focus either on cyber crime [19,2,9], or, if looking at 'real-world' crime, provide initial frameworks focused on hard evidence [17,1]. Some research, though, has noted that "more attention should be paid to human and social factors" [24].

The challenge of identifying what soft evidence is relevant is all the more prominent in HCSS, as the physical evidence in the scenes are purposefully altered by the criminal in order to mislead investigators as to what has actually taken place. Moreover, in HCSS cases, the soft evidence that can be collected and interpreted is heterogeneous and multi-faceted. For example, soft evidence of various and differing realms might be relevant, such as the prior medical condition of the deceased, their social networks, any monetary or financial agreements they may have had, the behavior of the criminal and their victim prior to the murder, the behavior of the criminal at the death scene, the characteristics of the death itself, and so on.

Finally, HCSS cases are in an ever-changing state. If we consider the homicidal crime scene as the final state of a 'system', with our goal being understanding the behavior of the system's 'users' (e.g., criminals and law enforcement)–we need to consider the system's transition through different states. Thus, when applying conceptual modeling techniques in order to gain insights about crime scene and the behavior of its relevant 'users', we need to account for its various transition states, such as actions taken:

1. before the homicidal crime is committed;
2. when the homicidal crime is being committed;
3. when the staging of the scene takes place;
4. when the police officers arrive to investigate the crime scene at hand; and
5. when the criminal returns to the crime scene for further staging.

3 Conceptual Modeling for Staging Detection

This section presents a case study of homicide crime scene staging by analyzing staging actions taken in an actual homicide case, and modeling them with conceptual modeling techniques. The case study draws from an ongoing project tasked with developing a decision-support system for law enforcement officers arriving at a suspected homicide crime scene, using a knowledge base of previous cases of homicide staging to support evidence collection in situ.

3.1 Case Study: TPH 3002/00 the People v. Siboni

In this criminal case, a circumstantial murder conviction was ruled, even though the murderer never admitted to their killing, made significant effort to conceal the true criminal nature of the death scene, and hard evidence in the form of forensic tests was immaterial as tests rendered inconclusive.

The criminal, Siboni, was married to the victim, his wife Mendy, for fifteen years. One day, in September 1999, upon deciding it was time for him to move out to live with his younger lover, he shot his wife in their bedroom. Mendy was 'found' dead by Siboni after being shot in her head once. Upon 'finding' his wife, Siboni called the emergency number, asking them to instruct him as to how to revive his wife. Upon the emergency services arrival at the couple's house, the rescue team was let in by a neighbor. Siboni was still in the bedroom, soaking his wife's head bleeding into a towel. A physician at the rescue team confirmed Mendy's death. Police investigators at the murder scene documented Siboni's claim that his wife shot herself by accident while checking her gun. His version for the events was that he took out the gun he legally owned from the bathroom, left it on their bed, and went downstairs. When he got back to their bedroom, he found Mendy holding the gun towards her eyes, stating that she was looking for 'dirt' in the barrel. Realizing how dangerous this was, he reached out for the gun, trying to get it out of her hand, when it discharged, and hit her in her forehead.

Siboni made sure to take their young children to kindergarten before Mendy's murder. Additionally, he notified the maid that she was not needed for her cleaning chores that day, since Mendy, as he described it, was not feeling well. In his 'efforts' to revive Mendy after the shooting, Siboni was able to move the gun away from her and explain his fingerprints on it as part of his attempt to prevent her from pulling the trigger. He was therefore the only person with her and the last to have seen her alive. Upon the arrival of the rescue teams he had told them the emergency services as well as the neighbors gathered in the house that Mendy shot herself. At the time, he also described their relationship to the police as ideal, despite being on the verge of divorce as the couple made a divorce settlement he hid from the police, and despite having had a lover for over a year. Moreover, later it was revealed that Siboni was supposed to move out from their house that day but had no alternative accommodation arrangements yet.

Siboni's actions led the police to be skeptical of his version of the way Mendy's death unfolded. Yet, he was only arrested on suspicion of her murder a year and a

half later, when the collection of soft circumstantial evidence seemed to amount into substantial incriminating evidence required for the handling of the case by criminal prosecution. Particularly incriminating soft circumstantial evidence were wiretapped and recorded phone conversations with his lover a year and a half after Mendy's death, having had an intense sexual night for which the lover praised Siboni's sexual performance, while incidentally referring to Mendy's death.

Law enforcement's skepticism, and Siboni's eventual murder conviction, was based on circumstantial soft evidence surrounding his behavioral patterns prior, during and after his wife's death. Within these soft circumstantial evidence were for example suspicious behavior such as his discarding of the divorce agreement written and signed by both, hardly arriving to console Mendy's family at her burial and commemoration gatherings, seeming to Mendy's family not impacted and even emotionally joyful, or at least indifferent to Mendy's death. Moreover, he refused to grant the police permission to send Mendy's body for an autopsy, and was eventually found as being on the verge of a divorce and having no alternative place to live on the day Mendy 'accidentally' shot herself. Moreover, he had an extra-marital affair for which he was willing to leave Mendy which he initially concealed from police investigators, had had financial hardships in light of the upcoming divorce and partition of joint assets, and additional soft evidence on Mendy's skilful knowledge of gun handling and shooting,

Siboni's evolving and ever changing account of the events that led to Mendy's death, the improbability of an alternative explanation of Mendy having shot herself, and the gathered soft evidence tarnished Siboni's credibility in the eyes of the court. This collection of soft circumstantial evidence was of utmost importance in Siboni's murder conviction, not only because the scene was tampered and staged, but more so because all forensic tests which law enforcement conducted (for example, to assess the probability of an accidental shooting in the angle described on Siboni, as well as shooting residues on Siboni and Mendy's palms) rendered inconclusive.

3.2 User Stories in Homicide Staging

Homicide crime scene staging, in the context of systems analysis, can be seen as user behavior, where criminals engage in systematic activity (staging) with a clear goal (to avoid detection by other stakeholders, i.e., detectives). For law enforcement to detect this kind of behavior, we need to systematically capture the patterns of behavior, meaning what *actions* a criminal took, and what *goal* they hoped to achieve in doing so. To do this in a systematic, yet intuitive way, we capture these behaviors as user stories to explicitly structure how actions taken by criminals and law enforcement threaten and mitigate the uncovering of crime scene staging.

Below in Box 1 we extract criminal user stories from Section 3.1's case study, writing the actions and intended goals taken by the criminal in *People v. Siboni*. These should all be read as originating from the role of the *criminal* (e.g., as a typical user story, being prefaced with 'As [a criminal],). Moreover, we divide

the actions into the three chronological transition states of a crime scene as discussed in Section 2.2. We additionally highlight in red actions that the criminal *failed* to take, which importantly led to law enforcement's suspicion, continued investigation, and eventual criminal indictment.

Box 1. Criminal User Stories for *People v. Siboni*

(1) (Before the) Homicidal crime is being committed:

- I want to [murder my wife], so that [I can move in with my lover]
- I want to [be alone], so that [there are no witnesses to my murder].
  - I want to [take my kids to kindergarten], so that [there are no potential witnesses to the murder]
  - I want to [give my maid the day off], so that [there are no potential witnesses to the murder]

(2) Staging of the scene takes place:

- I want to [call authorities after murder and ask for instructions how to revive my victim], so that [I avoid initial suspicion]
- I want to [attempt to 'revive' my victim], so that [I can explain my otherwise incriminating fingerprints on the murder weapon]

(3) When police officers arrive to investigate the crime scene at hand:

- I want to [tell the rescue team and other people prsent that my victim shot herself accidentally], so that [there is a non-criminal explanation of the death]
- I want to [conceal suspicious facts], so that [I avoid initial suspicion]
  - I want to [conceal the fact of my relationship troubles to the police], so that [I avoid initial suspicion]
  - I want to [conceal the fact of having had a lover for over a year], so that [I avoid initial suspicion]
  - I want to [conceal the fact I was meant to move out that day with no alternative accommodation], so that [I avoid initial suspicion]
- I want to [object to an autopsy], so that [hard evidence cannot be collected]
- I want to [avoid suspicion by my environment], so that [I get away with my crime] **(FAILED)**
  - I want to [console my victim's family], so that [I avoid suspicion] **(FAILED)**
  - I want to [be seen as mourning my victim], so that [I avoid suspicion] **(FAILED)**
  - I want to [keep my account of the events consistent], so that [I avoid suspicion] **(FAILED)**

Next, in Box 2 we capture user stories from the role of *law enforcement*, necessarily only from the third chronological state of when police officers arrived to investigate the (potential) crime scene at hand. As Box 2 shows, while the criminal's actions mitigated law enforcement from achieving several key goals in gathering evidence, their failure to avoid suspicion by their environment led to law enforcement's skepticism and further collection of soft evidence. Here, we highlight in red which actions taken by law enforcement were failed, or were (at least temporarily) mitigated by the criminal's actions.

Box 2. Law Enforcement User Stories for *People v. Siboni*

(3) When police officers arrive to investigate the crime scene at hand:

- I want to [interview potential witnesses], so that [I can determine whether the cause of death is of criminal nature] **(MITIGATED)**
- I want to [investigate the potential murder weapon], so that [I can determine whether the cause of death is of criminal nature] **(MITIGATED)**
- I want to [investigate whether the victim's injury makes sense with the accident scenario], so that [I can determine whether the cause of death is of criminal nature]
  - I want to [conduct forensic tests on the shooting angle], so that [I can determine whether there was staging] **(FAILED)**
  - I want to [conduct forensic tests on the shooting residues], so that [I can determine whether there was staging] **(FAILED)**
- I want to [investigate the relation between the victim and the suspect], so that [I can determine whether the suspect had motive]
  - I want to [interview the suspect about their relationship with the victim], so that [I can determine whether the suspect had motive] **(MITIGATED)**
  - I want to [interview the suspect's environment about their relationship with the victim], so that [I can determine whether the suspect had a motive]
- I want to [wiretap the suspect's phone], so that [I can collect incriminating soft evidence]

These user stories only capture a small part of the wealth of context and behavioral data relevant to crime scenes. However, they help in more clearly showing (eventual patterns of) criminal actions that mitigate law enforcement actions—in this case mitigating critical law enforcement resources like witnesses, analysis of the murder weapon, and initial interview of the suspect. However, the criminal failed in taking actions to avoid arousing suspicion by their environment, which allowed law enforcement to build a case base and (on a longer time-frame) collect enough evidence to secure a prosecution.

3.3 (Mis)Use Cases in Homicide Staging

The key value of systematically extracting and explaining the actions taken by criminals and law enforcement in these cases is not what actions they took and why, but how criminal actions *mitigated* law enforcement actions. In other words: how criminal misuse cases threaten law enforcement use cases. To exemplify this, we have modeled the above case as a Use Case Diagram shown in Fig. 1, with criminal actions as misuse cases, and law enforcement actions as use cases.

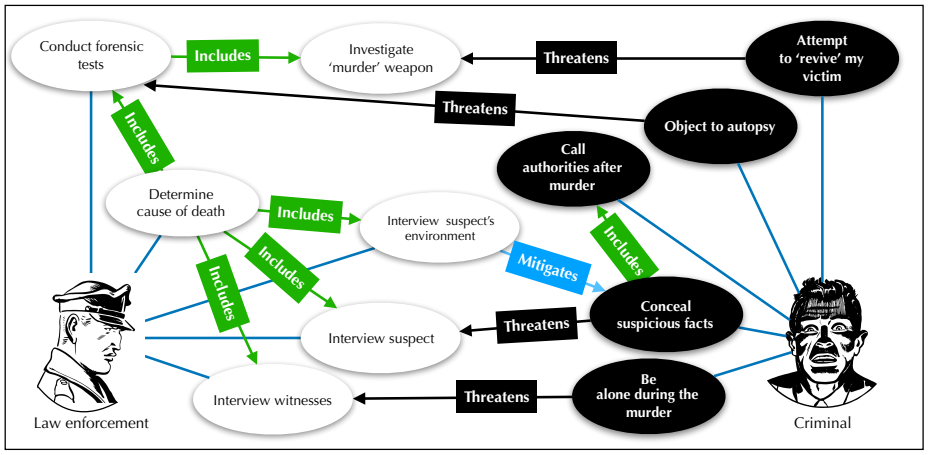

Fig. 1. Use/misuse case diagram of the interplay between criminal and law enforcement actions in the modeled People v. Siboni case.

Figure 1 visually shows that the key action by law enforcement here was the interviewing of the suspect's environment, as it led to a breakdown in their ability to conceal suspicious facts. Note that there is no use case for 'avoiding suspicion by my environment', as this was a critical set of actions *not* taken by the criminal, which may have allowed them to threaten law enforcement's 'interview suspect's environment'. Abstracting this to model a more general model, we see in Fig. 2 a general 'balance' between the criminal attempting to stage a crime scene, and law enforcement's uncovering what truthfully happened.

What is *critical* here for law enforcement, is the use case of 'consider signs of staging'–to continuously and systematically assess signs of stating in order to mitigate crime scene staging actions taken by criminals. This requires further work in extracting patterns of staging (and which law enforcement actions they mitigated or frustrated), and building support systems for law enforcement while investigating crime scenes.

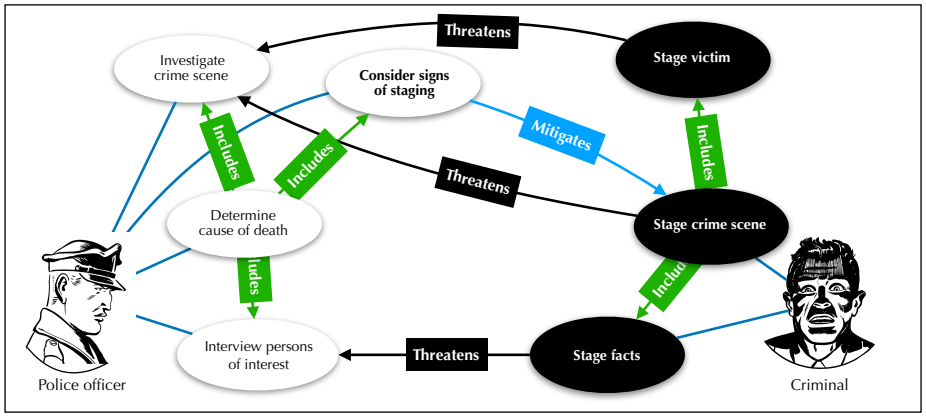

Fig. 2. Abstract use/misuse case diagram of actions in crime scene staging.

4 Discussion and Future Work

In this research-in-progress paper we highlight crimino-forensic processes related to soft evidence collection as an exciting new opportunity for interdisciplinary collaboration between information systems and criminology researchers. The need for conceptual modeling techniques arises due to the nature of information that needs to be collected at a crime scene. This information is heterogeneous, unstructured and sometimes extremely ethically and legally sensitive. This leads to the idea explored here of thinking of a crime scene as a complex system with different stakeholders that use and manipulate it. Based on a real HCSS case from our ongoing project, we have shown here how structure can be introduced into existing data on HCSS by using conceptual modeling techniques like user stories and (mis)use cases models.

Such UML models with an accessibly friendly secondary notation for non-technical notation [23] are a good first step in visualizing and thinking about the way in which actions taken by suspects and law enforcement threaten and mitigate each other. They visually bring together these actions and relations in a single diagram, which aids in the reconstruction of what happened before, during, and after the crime, moreso than considering only textual descriptions of soft evidence. We opted for this approach, using these straightforward and accessible requirements engineering notations to fit the needs of domain experts–criminologists who want ways to help structure and reason over tons of soft evidence, while having little time or appetite to become professional modelers themselves. Thus, while arguably the presented reasoning could be captured with formal reasoning notations, or process modeling notations to capture their full procedural scope, this would do little to satisfy the direct domain expert needs: straightforward and usable notations that help in structuring and presenting knowledge.

This paper has so far presented only a single exemplary case study modeled collaboratively with a criminologist, with a limited number of actions, while a use case like 'conceal suspicious facts' will have many different concrete behaviors associated with it. For example, in *People v. Cooper*, the murderer attempted to conceal the true nature of his murder by constructing a possible motive for suicide by spreading lies that his wife was depressed for months prior to the murder, and subsequently staged the crime scene to look like a suicide by littering it with sleeping pills. A far larger number of behavioral patterns thus likely exist, which should be modeled in collaboration with criminologists in order to build a database capable of supporting law enforcement across different countries and cultures.

As reasoned above, given that the domain experts have little appetite to become professional conceptual modelers themselves, and there is no scope to 'model for the sake of modeling', where information systems research can thus further support criminologists working on HCSS is not only aiding in structurally capturing and documenting patterns relevant to HCSS, but to be able to move such patterns into an evolving and constantly updated knowledge base, based on which evidence-based decision support can be facilitated, aiding law enforcement in detecting similar patterns, as visualized in Figure 3. Such expert systems could hide entirely the formal underlying mechanisms and knowledge representation, instead simply providing intuitive means of entering and representing soft evidence.

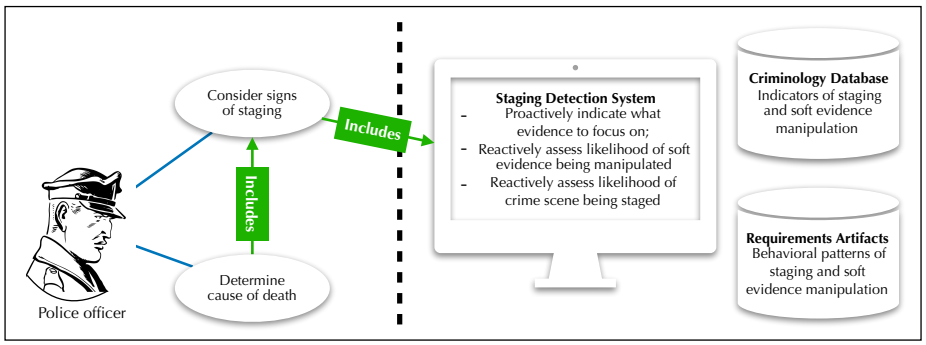

Fig. 3. Components of a system that could support law enforcement in detecting crime scene staging.

To support the development of such databases and support systems, a significant combined research effort from information systems engineers and criminologists is required, including:

– Modeling of past cases to capture detailed behavioral patterns that show how soft evidence was manipulated and with what goal;

- Modeling how behavioral patterns of criminals relate to that of law enforcement, in particular how they threaten and mitigate each other;
- Linking these behaviors in a wider context of criminology data to ground them in e.g., specific criminological or socio-cultural contexts;
- Building decision-support systems incorporating the modeled data to both pro-actively point towards potentially suspicious behavioral patterns for a given context (e.g., in cases of femicide combinations such as the victim's partner reporting a suicide while the victim's family saw no indicators to support this), and to provide general indications of what 'not to miss' during initial crime scene investigation.

5 Conclusion

This research-in-progress paper presented just the tip of the iceberg in exploring how conceptual modeling techniques can be helpful for modeling and structuring various aspects of crimino-forensic processes. It is our hope that this paper will serve as a discussion starter on the topic of modeling for criminology and get more researchers involved in our ongoing efforts with criminologists to document and model behavioral patterns relevant to HCSS. One such discussion we foresee is to what extent these research efforts could be misused by criminals to aid them in staging crime scenes more effectively, complicating law enforcement's analysis efforts even further. As a consequence, building a data-driven system to support law enforcement should incorporate critical discussions and reflections on the cyber security of such systems, prompting yet more research opportunities for (security) requirements engineers.

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